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EXAMINER	
MILLER, MARINA I	
ART UNIT	**PAPER NUMBER**
1631	

DATE MAILED: 09/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/815,102	CONWAY, ANDREW A.	
	Examiner	Art Unit	
	Marina Miller	1631	

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

S.O.

DETAILED ACTION

Applicants' submission filed on 3/30/2004 is acknowledged. Claims 1-21 are pending. Claims 1-21 presently are under examination.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Non-Statutory Subject Matter

Claims 1-20 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 1-20 recite a method of using statistical analysis of genetic data to determine likely genetic regions for a recessive genetic disease or trait comprising steps of obtaining actual genotype data for affected people with a genetic disease in a population and their parents, obtaining estimated genotype data for the population, analyzing actual and estimated genotype data to find a region in genomes of affected people that includes markers of a particular homozygous pair of alleles more frequently, determining a set of scores under various assumptions, merging the scores to receive a score for each marker, and determining a region of markers with a high score. "However, not all processes are statutory under 35 U.S.C. 101." *See* MPEP § 2106. The disclosed method does not recite physical steps to be performed in order to achieve the goal of the method. The steps of obtaining actual genotype or estimated genotype data is not necessarily limited to a physical step. For example, one may obtain genotype data stored in a computer memory (a databank) or from data entered into a computer (*e.g.*, results of PCR, electrophoreses, *etc.*). All other steps of the instant method are merely those of data

manipulation. The method does not actually transform a set of data, but only recites mathematical manipulations.

When a computer-implemented method does not recite a physical step or an actual transformation of data, it may be statutory when the claimed invention as a whole accomplishes a practical application. "That is, it must produce a useful, concrete and tangible result." *See* MPEP § 2106. In the instant case, the result of the method is the determination of a region of markers that has a high run of merged scores. The claims do not recite tangible expression of the determination of the region of markers and/or locating a statistically significant gap in the scores (*see* instant claim 10), nor any recitation of an actual (*i.e.*, concrete) result in a form useful to one skilled in the art. Thus, the method does not recite steps of producing something that is concrete, useful, and tangible, and is not statutory.

Lack of Utility

Claims 1-21 are rejected under 35 U.S.C. 101 because the claimed invention lacks patentable utility.

The instant claims are directed to a specific method and a system for using statistical analysis of genetic data to determine likely genetic regions for a recessive genetic disease or trait. The specification discloses on p. 1 that the instant invention relates to detecting recessive diseases in inbred population. Applicants did not identify any specific and substantial utility for the invention. The asserted utility in this case essentially is a method for determining an unspecified, undisclosed trait. The method results in the score that determines a genetic region. No evidence discloses any connection of the scores to affected people, *i.e.*, whether the scores actually reflect presence of a recessive disease in a region and whether the region is actually

associated with a disease. Therefore, determining a region responsible for a recessive trait would require or constitute carrying out further research to identify or reasonably confirm a "real world" context of use. Therefore, the invention of claims 1-21 lack a substantial utility.

The invention also lacks a specific utility because the invention is not particular to a specific disease or trait being claimed and is applicable to the general class of traits. In order for the result of the method to be used for determining recessive diseases in inbred population, one skilled in the art must be aware of the correlation between the information received (*e.g.*, genotypes of affected and unaffected population; a region of markers; a set of scores for markers) and a condition to be diagnosed (*e.g.*, FMF autosomal recessive disorder, achromatopsia, Alzheimer's disease, *etc.*). *See*, for example, Kruglyak et al., *Am. J. Hum. Genet.*, 56:519-527 (1995). Absent the disclosure about, for example, allele frequencies in affected and unaffected population, and/or correlation between a region of markers and a disease to be diagnosed, the asserted utility is not specific. No such information is recited in the instant claims; further research would be required to determine such a correlation. As such, the invention lacks a specific and substantial utility. Applicant is reminded that a "use" to perform further research is not a utility under 35 U.S.C. 101. For the reasons stated above, the instant invention lacks a patentable utility.

Claim 21 is directed to a system for performing the instant method. Because the method does not have any patentable utility, any computer system implementing such a method would also be lacking utility. The system in this case performs a method which produces no useful result, and one of ordinary skill in the art would not know for what purpose or to what useful end such a system might be used for, therefore, the invention lacks utility.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1, 11, and 21 recite the limitation "merging the score." It is not clear what scores are merged, *e.g.*, scores within sets, sets of scores, determined and reference scores, *etc.* As the intended limitation is not clear, claims 1-21 are indefinite.

Claims 1, 7-9, 11, 17-19, and 21 recite the limitation "a high run of merged scores." It is not clear what limitation is intended and neither specification nor claim defines the term "high run" as compared with a non-high run. Thus, claims 1-21 are indefinite.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-6, 9-16, and 19-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Arbour et al., *Human Mol. Genet.*, 6(5):689-694 (1997).

Claims 1 and 11 are drawn to a method of using statistical analysis of genetic data to determine likely genetic regions for a recessive genetic disease or trait. Arbour et al. disclose a method for homozygosity mapping of achromatopsia (*see* abstract). The method comprises steps of obtaining genotype data for affected people with a genetic disease in a population and their parents (fig. 1 on p. 690 and p. 692), obtaining estimated genotype data for the population (data for Jewish families of affected and unaffected individuals) (p. 692 and Table 3 on p. 691), analyzing actual and estimated genotype data to find a region in genomes of affected people that includes markers particular homozygous pair of alleles more frequently (*see* p. 690 *Linkage to chromosome 2* and p. 692, *Linkage Mapping*), determining a set of scores (LOD) under various assumptions (*e.g.*, inheritance of both copies of the disease gene from a single common ancestor (p. 689), marker allele frequencies are equal (p. 693)) for each marker (*see* p. 690 *Linkage to chromosome 2* and p. 692, *Linkage Mapping*), merging the scores to receive a score for each marker (*see* tables 1-2 in conjunction with fig. 3), determining a region of markers with a high score (p. 690, right col.). Thus, Arbour et al. anticipate instant claims 1 and 11. Arbour et al. disclose Jewish inbred population wherein achromatopsia is common (p. 689), thus anticipating instant claims 2 and 12. Arbour et al. disclose autozygous homozygous pairs of alleles (homozygosity in which two alleles are copies of an ancestral gene) (p. 689, right col. and fig. 1), thus anticipating instant claims 3 and 13. Arbour et al. disclose a score of markers representing a comparison of a likelihood of markers wherein people with disease are autozygous at the marker versus a likelihood of the marker for alleles independent of the disease (p. 690 and table 1), thus anticipating instant claims 4 and 14. Arbour et al. disclose that markers with a higher score are more likely associated with a disease (p. 690, right col.; p. 691, right col.; table 2), thus

anticipating instant claims 5 and 15. Arbour et al. disclose arraying scores by a chromosomal order of markers (table 2 and fig. 3), thus anticipating instant claims 6 and 16. Arbour et al. discloses determining additional regions of markers having high score (p. 690, right col.), thus anticipating instant claims 9 and 19. Arbour et al. disclose locating a statistically significant gap in scores of non-overlapping markers (*see* scores for markers D2S441 and GATA123B03 in table 2 and fig. 3), thus anticipating claims 10 and 20.

Claim 21 is directed to an apparatus for performing a method of the instant claim comprising a processor, input and output interfaces, and a memory storing instructions for executing the instant method. Arbour et al. disclose that the analysis of the LOD score was performed with the LINKAGE and FASTLINK programs (p. 692, *Statistical Analysis*). Therefore, Arbour et al. inherently disclose using a computer (*i.e.*, a processor, input/output interface, and a memory). Thus, Arbour et al. anticipate instant claim 21.

Claims 1-4, 11-14, and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Kruglyak et al., *Am. J. Hum. Genet.*, 56:519-527 (1995).

Kruglyak et al. disclose a method for homology mapping of recessive traits comprising steps of obtaining actual and estimated genotypes (p. 522, *Data*), analyzing genotypes to find a region that includes markers exhibiting particular homozygous pair of alleles more frequently (p. 523), determining a set of scores for each marker (LOD, p. 522), merging the scores (p. 522 and fig. 3), and determining a region of markers that has a high run of merged scores (see p. 524, fig. 3). Thus, Kruglyak et al. anticipates claims 1 and 11. Kruglyak et al. discloses inbred population used for studying FMF autosomal recessive disorder (p. 519, left col.; p. 521), thus anticipates claims 2 and 12. Kruglyak et al. disclose autozygous homozygous pairs of alleles (homozygosity

by descent) (p. 519), thus anticipating instant claims 3 and 13. Kruglyak et al. discloses a score of markers representing a comparison of a likelihood of markers wherein people with disease are autozygous at the marker versus a likelihood of the marker for alleles independent of the disease (p.523, right col.), thus anticipating instant claims 4 and 14.

Kruglyak et al. disclose a computer system performing his method comprising a computer running a program, a user interface and a display (*i.e.*, input/output interface), and a memory (*see* p. 521-522), thus Kruglyak et al. anticipate claim 21.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 7-8 and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arbour et al., *Human Mol. Genet.*, 6(5):689-694 (1997), as applied to claim 1-6, 9-16, and 19-21, in view of Kruglyak et al., *Am. J. Hum. Genet.*, 56:519-527 (1995).

Arbour et al. teach a method and a system for using statistical analysis of genetic data to determine likely genetic regions for a recessive genetic disease or trait, as set forth above.

Arbour et al. do not specifically disclose determining a consecutive portion of an array of scores with the highest sum. Arbour et al. do not specifically disclose markers having high score being found by computing all sums of adjacent elements in a marker array.

Kruglyak et al. disclose a method of multipoint linkage analysis of recessive trait in

families including homozygosity mapping (*see* abstract). Kruglyak et al. disclose a consecutive portion of an array of scores with the highest sum (a graph of LOD v. map position of markers, p. 524). Kruglyak et al. disclose computing of the likelihood L as a sum of adjacent elements in a marker array (*see* Appendix on p. 525).

It would have been obvious to one of ordinary skill in the art at the time of the instant invention to modify the method of Arbour et al. to use a new algorithm for rapid multipoint likelihood calculations, such as taught by Kruglyak et al, where the motivation would have been to improve likelihood computations with dozens of markers in presence of highly polymorphic loci and of missing genotype information, as taught by Kruglyak et al. p. 520, left col.

Conclusion

No claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marina Miller whose telephone number is (571)272-6101. The examiner can normally be reached on 8-5, M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ardin Marschel, Ph. D. can be reached on (571)272-0718. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Marina Miller
Examiner
Art Unit 1631

MM

9/3/05
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SUPERVISORY PATENT EXAMINER